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Radiological evaluation of vaginal width and depth in male-to-female transsexuals by the use of magnetic resonance imaging

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Abstract Nowadays, the surgical treatment of male-to-female transsexuals is not rare, but few studies have reported on postoperative results. The aim of this study was to determine the role of magnetic resonance imaging (MRI) in the evaluation of the results of sex reassignment surgery (SRS) in male-to-female transsexual patients. Ten such patients (median age 28 years, range 21–47), who had undergone SRS using an inversion of combined penile and scrotal skin flaps for vaginoplasty, were examined with MRI after the operation. Turbo spin-echo T2-weighted and spin-echo T1-weighted images were obtained on sagittal, coronal, and axial planes with a 1.5 T superconducting magnet. The images were acquired on the sagittal, coronal and axial planes, by using TSE T2 weighted and SG T1 weighted images. MRI was performed within 2 weeks after the operation in six patients and after 1 year in the other four. In all cases, the images were obtained with and without an inflatable silicon vaginal tutor. The average neovaginal depth was 7.9 cm (range 6–10 cm). In four patients, MRI showed the presence of cavernosal rests, and in two there were remnants of the corpus spongiosus. In another patient, an abnormal anterior inclination of the neovagina was present. The average distance of the recto-vaginal septum was 4 mm (range 3–6 mm). No major complications were noted. Our study allowed not only a detailed assessment of the pelvic anatomy after genital reconfiguration, but also provided valuable information on possible complications.

Keywords Magnetic resonance imaging · Transsexualism · Neovagina

Sex reassignment surgery (SRS) has been performed on thousands of transsexual patients over the past 30 years. Although the urological treatment of male transsexuals is becoming more common, few follow-up studies have been reported in the literature. Moreover, there is an evident difficulty in the objective evaluation of results after SRS: in fact the international literature generally lacks consistent published information on the surgical results. In our opinion, evaluation of the results of SRS for male-to-female transsexuals should involve not only functional, aesthetic or psychosexual results, but also imaging modalities.

The aim of this study was to assess the value of magnetic resonance imaging (MRI) in the evaluation of results in SRS.

Materials and methods

Since 1994, 98 male-to-female transsexual patients have undergone SRS at our institution in Trieste. All patients had been cross-dressing, living as women and receiving estrogens and progesterone for a long time. Patients were at least 21 years old (mean age 31, range 21–59). Before surgery, each underwent a complete psychosexual evaluation. Hormone therapy was discontinued 1 month before the intervention. The procedure included bilateral orchiectomy and penectomy and consisted of the creation of the urethrostomy, neovagina (vaginoplasty), labial structures and a sensate neoclitoris. To create the neovagina, inverted penile skin vaginoplasty was used in the first nine patients, in the other cases, the penile and scrotal skin inversion technique was adopted using the inversion of a combined scrotal and penile skin flap for vaginoplasty.

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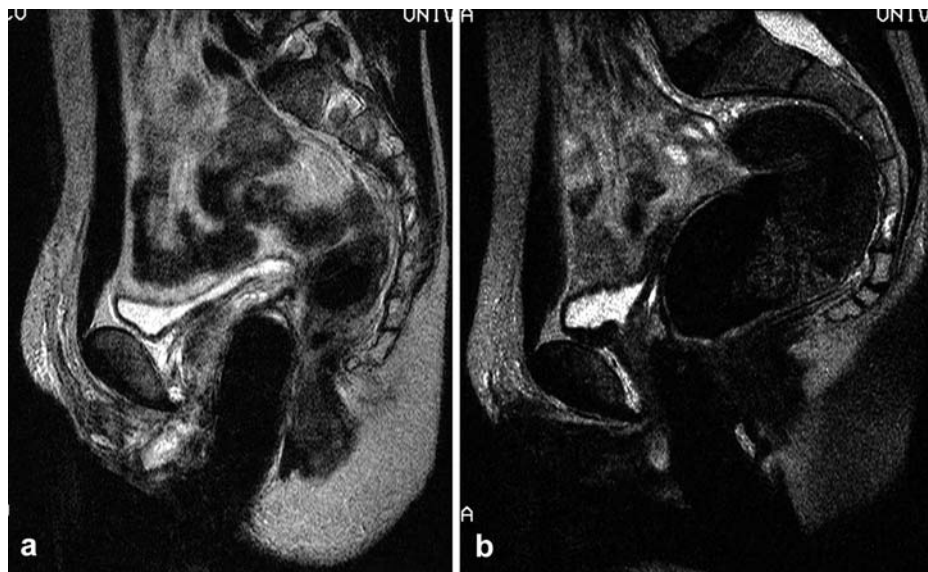


Fig. 1 MR image of a patient who underwent surgery in 2001: the neovagina is 11 cm long

Ten of the 98 patients underwent MRI: seven patients in the immediate postoperative period, while three patients were studied 1 year after surgery. The MR images were acquired using a 1.5 T superconducting magnet on the sagittal, coronal and axial planes, with TSE T2 and SE T1 weighted sequences. In all patients, the images were obtained with and without a silicon vaginal tutor. The following parameters were considered:

1. the neovaginal depth
2. the neovaginal inclination on the sagittal plane (rectovaginal angle)
3. the presence of remnants of the corpora cavernosa and of the corpus spongiosum
4. the thickness of the rectovaginal septum.

Fig 2 a MR shows the ideal anterior-posterior inclination.
b In this case the inclination of the neovagina is too anterior



Results

Neovaginal depth

The average neovaginal depth was 7.9 cm (range 6–10 cm), consistent with the normal female vaginal length (7–8 cm). Neovaginal depth was better studied using the inflatable vaginal tutor. Moreover, the results on neovaginal depth were related to the date of surgery. From 1994 to 1999, the period of commencement of our learning curve, the neovaginal depth reached an average of 7.3 cm in the three patients examined. In the last 2 years, however, the average neovaginal depth has increased up to 8.5 cm (Fig. 1).

Neovaginal inclination

The inclination of the neovagina in the sagittal plane had a correct oblique inclination from front to rear and from low to high in four patients (Fig. 2a), similar to the inclination of the female vagina. In five patients, the neovagina had no oblique inclination in the sagittal plane, while in one patient the inclination was from the rear to the front and from low to high (Fig. 2b).

Presence of remnants of the corpora cavernosa and the corpus spongiosum

Remnants of the corpora cavernosa and of residual spongiosal tissue were evident in three patients (Fig. 3), remnants of corpora cavernosa was also evident in three other patients, while residual spongiosal tissue was detected in one patient. In two patients, no remnants were detected.

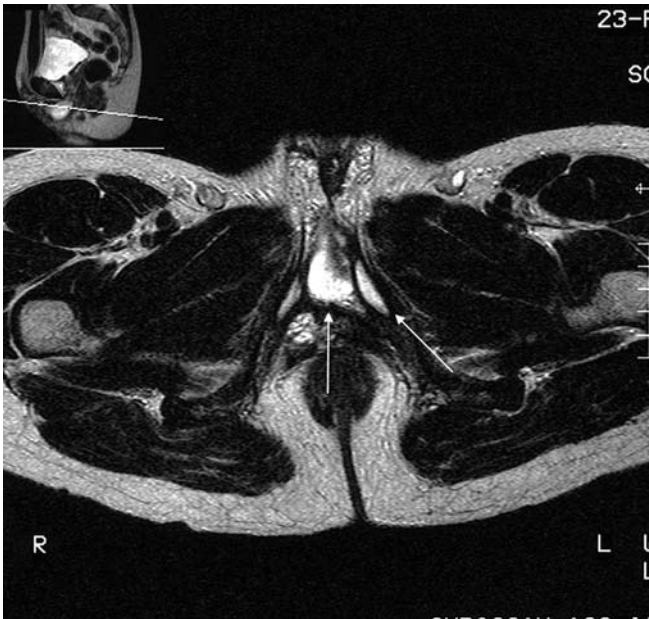


Fig. 3 In this patient, the remnants of erectile tissue (corpora cavernosa and urethral corpus spongiosum) are evident (arrows)

Thickness of the rectovaginal septum

The average thickness of the rectovaginal septum was 4 mm (range 3–6 mm) (Fig. 4).

Discussion

Among the principal aims of SRS is the creation of a neovagina of adequate depth with the correct inclina-



Fig. 4 In this case, MR shows a rectovaginal septum of 3 mm thickness

tion. MRI accurately depicted both features, which were better evaluated by using an inflatable vaginal tutor.

In our series, the average neovaginal depth was 7.9 cm; in our opinion this is an optimal result if we consider that female vaginal length is normally 7–8 cm. Moreover, we also consider this an important achievement in terms of personal feedback since our patients attach great importance to acquiring attractive and appropriate female genitalia. Therefore, in our experience, in order to reach the best results in neovaginal depth it is mandatory to: (1) use the correct vaginal stent or daily utilization of a vaginal dilator to keep the vagina patent [5], (2) have the maximum knowledge of the rectoprostatic space, (3) identify Denonvilliers' fascia, (4) use the penile skin as a flap, together with a caudally pedicled scrotal flap, and (5) to totally resect the corpora cavernosa.

The aim of SRS is the creation of a neovagina with a correct anterior-posterior inclination. We have verified that for a good anterior-posterior inclination surgical access as close as possible to the rectum is mandatory. If the blunt dissection for the creation of the neovagina is performed closer to the urethra, the inclination of the neovagina is more anterior. As reported in some basic sources on anatomy, the female vagina extends on average obliquely from front to rear and from low to high [3]. In order to obtain the best results in neovaginal inclination and depth, we think that surgical access as close as possible to the anal orifice is very important.

We have noticed that the incomplete resection of erectile tissue from the corpus spongiosum or corpora cavernosa can cause unpleasant symptoms, such as protrusion of the urethral meatus, and the swelling and narrowing of the vagina [4].

MRI accurately depicted the remnants of corpora cavernosa and/or corpus spongiosum in seven patients. In fact, until 1999 we usually did not perform a complete resection of the erectile tissue because we thought that maximum erotic stimulation occurred in the two remaining corpora cavernosa along the pubic rami. However, our current strategy has changed. We now try to perform a complete resection of the erectile tissue because we know that remnants may lead to stenosis of the neovagina or to other unpleasant symptoms [6]. At the beginning of our experience, we used to perform a running suture on the remnants of the corpora near the pubic bone because it was thought that the presence of residual erectile tissue could be important for sexual arousal. At present, after MRI studies, erectile tissue of corpora cavernosa is completely removed as close as possible to the pubic bone. We think that for sexual arousal the construction of a sensitive clitoris with part of the glans is of more importance.

In order to obtain a cavity for the neovagina of adequate depth and length, a wide blunt dissection of the space anterior to the rectum and posterior to the prostate and bladder is mandatory [1]. This is the most dangerous phase of the operation because accidental rectal injuries are possible [2]. Finally MRI was able to

provide an accurate evaluation of the thickness of the rectovaginal septum which, after SRS, was only a few millimeters. In order to obtain a more trophic rectovaginal septum, we now always preserve part of the bulbocavernosus muscle. In our last patients, for whom this method was used, the septum was found to be thicker.

Conclusions

MRI allows not only a detailed assessment of the pelvic anatomy after genital reconfiguration, but also provides valuable information on possible complications. Moreover, an accurate analysis of MRI findings provides information which can help the surgeon in adopting the best surgical approach.

Optimal treatment of these patients requires a multidisciplinary approach with a nucleus of physicians who see the patients frequently: a psychiatrist, an endocrinologist, a plastic surgeon, a gynecologist, a radiologist and a urologist. In our opinion, our results clearly demonstrate that the close cooperation between these

specialists under the guidance of the urologist, who must be the leader of the team, is the key to success in treating transsexuals patients.

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